

Appl. No. 10/621,071  
Amdt. Dated June 18, 2007  
Reply to Office action of April 23, 2007

## **REMARKS**

Claims 18-20, 22-37 and 45 were pending. No claims are amended. Claims 1-17, 21 and 38-44 were previously canceled without prejudice or disclaimer of subject matter. Claim 45 is withdrawn by the Examiner. No claims are added.

The claims appear to be subject to election/restriction. Claims 18-20 and 22-29 were rejected under 35 U.S.C. § 102(b) as being anticipated by Vollmer (US 6,149,051). Claims 18-20 and 22-29 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Vollmer (US 6,149,051). Claims 30-37 were allowed.

### **Allowable Subject Matter**

Applicants thank the Examiner for his indication of allowed claims 30-37.

### **Election / Restriction**

The Examiner appeared to require election between the species of claims 19-20 and 22-37 and the species of claim 45, the former containing Zr, and the latter without Zr, in the previous Office Action. It appears this election was made in the previous Office Action, by original presentation, by the Examiner, to the species of claims 19-20 and 22-37. In any event, Applicants elected, with traverse, the species of claims 19-20 and 22-37. The Examiner does not appear to treat the election in the current Office Action. Therefore, Applicants repeat their traversal below and continue to request withdrawal of the election/restriction and rejoinder and examination of claim 45.

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Applicants traverse in that claims 19-20 and 22-37 do not necessarily contain Zr. Claims 19, 24-31, 33-35 and 37 do not necessarily contain Zr. Should the Examiner maintain the restriction/election, Applicants note that claim 18 is generic to both species. Therefore, should the first species be allowable, rejoinder and examination of the second species under the election of species guidelines (see, for example, MPEP 809.02(a)) is respectfully requested.

#### Examiner Interview

Applicants thank the Examiner for his time and willingness to discuss this pending matter. A telephone interview was conducted with the Examiner to discuss the rejection of the claims as made in the outstanding Office Action. Applicants discussed a proposed revised declaration to be submitted in support of allowance of the instant application. The declaration proposed to the Examiner is that as presented herewithin. While no specific agreement was reached, the Examiner agreed to consider the proposed revised declaration in view of the cited references.

#### Vollmer (US 6,149,051)

Vollmer discloses a braze material comprising substantially only a Ti-Cu-Ni-Zr mixture. In particular, the braze material may comprise 40Ti-20CU-20Ni-20Zr.

#### Claim Rejections – 35 USC 102

Claims 18-20 and 22-29 stand rejected under 35 USC 102(b) as being anticipated by Vollmer. Alternatively, Claims 18-20 and 22-20 stand rejected under 35 USC 103(a) as being unpatentable over Vollmer. Claim 18 has

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previously been amended to require the amount of Zr present, if any, in the braze material is “from 0 to not more than 12 wt%”. The brazing material of Vollmer contains relative amounts of the constituents at about 25-60 wt. % Ti, 10-25 wt. % Cu, 15-25 wt. % Ni and 15-25 wt. % Zr.

The braze material of the present invention includes Zr in an amount “from 0 to not more than 12 wt%”, as presented in claim 18, which is at a weight percent less than the range indicated by the teachings of Vollmer (about 15-25 wt%). Thus, the braze material of Vollmer differs from that used in the present invention, as described in claim 18, as amended. Because Vollmer differs from the present invention in at least one element, Applicants respectfully request reconsideration and withdrawal of the rejection of the claims as being anticipated under 35 USC 102(b) by Vollmer.

In a previous telephone interview with the Examiner, the Examiner expressed a position in which the lower limitation of “about 15wt%” of Vollmer may be read to anticipate the upper limitation of “not more than 12wt%” as instantly claimed. Applicants respectfully disagree for the following reasons.

It is well established that “anticipation under § 102 can be found only when the reference discloses exactly what is claimed.” Titanium Metals Corp. v. Banner, 778 F.2d 775, 227 USPQ 773 (Fed.Cir. 1985). Therefore, to maintain a rejection of the claims (which require “not more than 12wt% Zr”) as being anticipated by Vollmer (which disclose Zr from about 15-25 wt%), the term “about” must be read, in the range of “about 15-25 wt%”, to be the same as disclosing 12wt%. Applicants believe such an interpretation of “about” in this case is improper.

When a term of degree is present in a patent application, the patent Examiner must determine whether a standard is disclosed or whether one of ordinary skill in the art would be apprised of the scope of the claim. Titanium Metals Corp., 778 F.2d 775, 227 USPQ 773. In the present case, no standard appears to be present to define the term "about" in the Vollmer patent. Therefore, under the presumption of validity of the Vollmer patent, the scope of the term "about" must be able to be apprised by one of ordinary skill in the art. As discussed below with reference to the rejection under 35 USC 103, one of ordinary skill in the brazing arts would not even consider, in their broadest interpretation, that "about 15 wt% Zr" would mean 12 wt% Zr, as would be necessary for the Examiner to maintain a rejection under 35 USC 102(b). By holding such an interpretation of "about 15 wt%", one must imagine that the "about" term of degree may allow **differences of 20%** from the actually disclosed term itself. It is Applicant's position that, especially in the brazing arts, that such a reading of the term "about" would practically never be an interpretation of one of ordinary skill in that art. For this reason alone, Applicants take the position that the instant claims are not anticipated by Vollmer.

When the prior art discloses a range which touches, overlaps or is within the claimed range, but no specific examples falling within the claimed range are disclosed, a case by case determination must be made as to anticipation. In order to anticipate the claims, the claimed subject matter must be disclosed in the reference with "sufficient specificity to constitute an anticipation under the statute." Id. Assuming, *arguendo*, that the Examiner maintains that "about 15 wt%" touches on a claim of "not more than 12 wt%", Applicants maintain that a rejection under 35 USC 102 is still improper, as there is not any "sufficient specificity" in Vollmer to support a disclosure of "not more than 12 wt% Zr" as instantly claimed.

Therefore, for the plurality of reasons discussed above, with support of the discussion below with reference to the rejection under 35 USC 103, Applicants respectfully request reconsideration and withdrawal of the rejection of the claims as being anticipated by Vollmer.

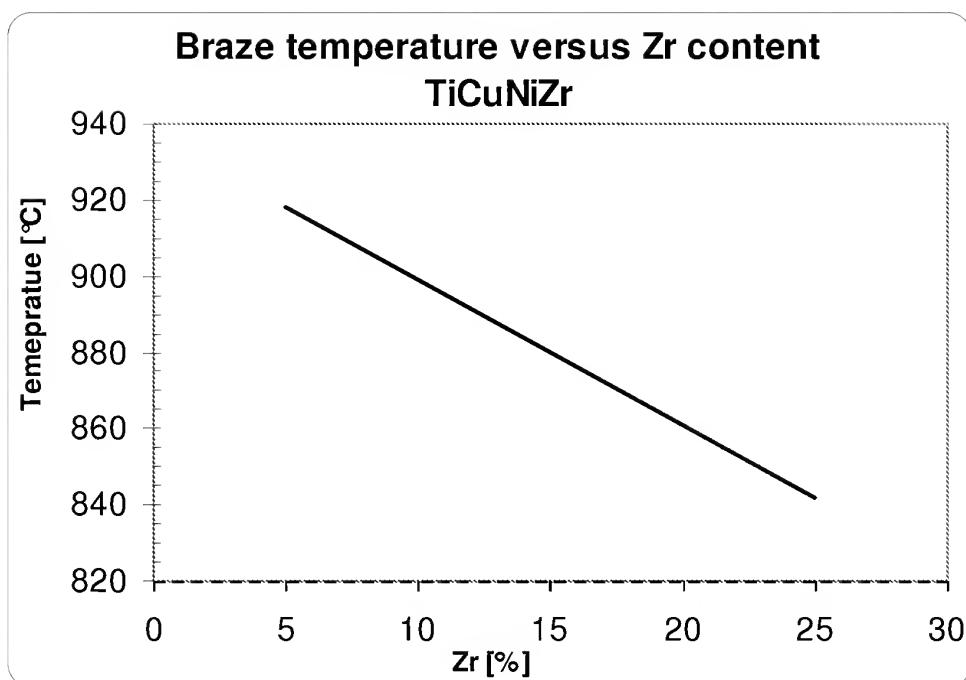
Claim Rejections – 35 USC 103

In addressing the rejection of the claims 18-20 and 22-29 as being unpatentable under 35 USC 103(a), the Examiner notes that Vollmer discloses that the amounts of Zr present are “about ... 15-25 wt %.” The Examiner takes the position, at page 7 of the Office Action, that “Vollmer’s teaching of about 15% necessarily encompasses the claimed upper limit of 12%.” Applicants respectfully disagree with this position for the reasons outlined below.

The Examiner argues that 15 wt % Zr encompasses the maximum of the range “from 0 to not more than 12 wt %” Zr as instantly claimed. This seems to **imply that the compositions can be off by plus or minus 1/5 (20%)** of the given compositions. Therefore, it appears that the Examiner is concluding that a **20% change** in composition makeup is close enough that one skilled in the art would expect properties to be the same. Applicants respectfully disagree. Clearly, one skilled in the art would understand, as evidenced by the enclosed declaration, that such a large variation in the braze composition would lead to significant differences in braze temperatures and poor brazes or ruined parts.

Temperature is critical for brazing. In many braze operations, temperature is kept within +/- 5 °C. If this range is breached, the braze may not melt or many properties of the base material may be deteriorated due to, for example, erosion.

The Figure below shows how brazing temperature changes with changes in Zr concentration.



If we consider varying the amount of Zr present in a braze composition between the two values (15 wt% and 12 wt%) which the Examiner has concluded would be close enough to be an obvious variation, the following observations may be made. The braze material tested to generate the data for the above graph is made of a 22Ni 18Cu xZr alloy, wherein Zr is varied between 15 and 12. In making this Zr variation, the braze temperature of this alloy changes by about 12°C.

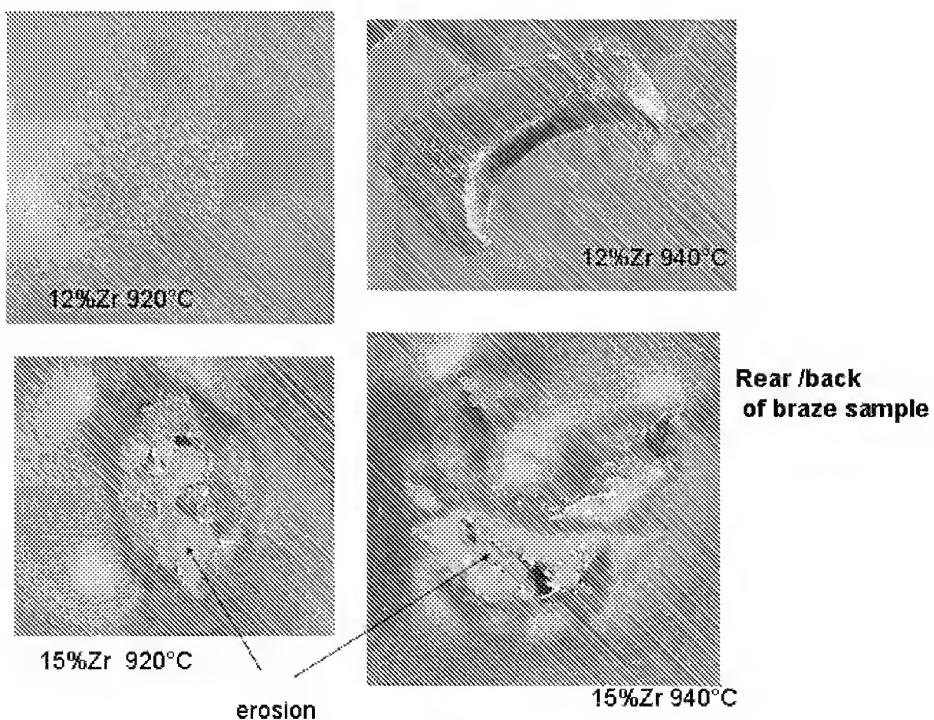
In another example, a 20Ni18CuXZr braze may show a melt temperature change of about 16°C when the Zr amount is changed from 12 wt.% to 15 wt.%.

Braze composition [wt%]	Melt Temperature [°C]
50Ti20Ni18Cu12Zr	883
47Ti20Ni18Cu15Zr	867

As stated above, if a braze operation temperature range (generally +/- 5°C) is breached, brazability is affected because such a change in temperature may change the melt properties of the braze and/or may deteriorate the base metal due to, for example, erosion. As indicated above, a Ti/Ni/Cu/Zr braze with 12% Zr will not have the same properties as one with 15% Zr. The melt temperature, the most critical property for a braze, is different (at least 12°C) and one skilled in the art would expect this to be the case. The Examiner states that there has been no evidence provided rebutting the Examiner's statement that one would expect a 12 and 15% Zr braze to have the same properties. Applicants suggest that the above Figures shows that the melt temperature, the most important property for a braze, does vary with Zr content and that going from 12 to 15% results in a change outside the normal permitted temperature range of a braze furnace (+/- 5°C). In addition, if one were to allow such a variation in chemistry of one alloy addition, one would have to accept similar variations (20%) for the other alloying elements, thereby resulting in a very large variation in melt temperature. Therefore, Applicants respectfully submit that "not more than 12 wt%" Zr as instantly claimed is outside the scope of 15-25 wt% Zr as taught by Vollmer.

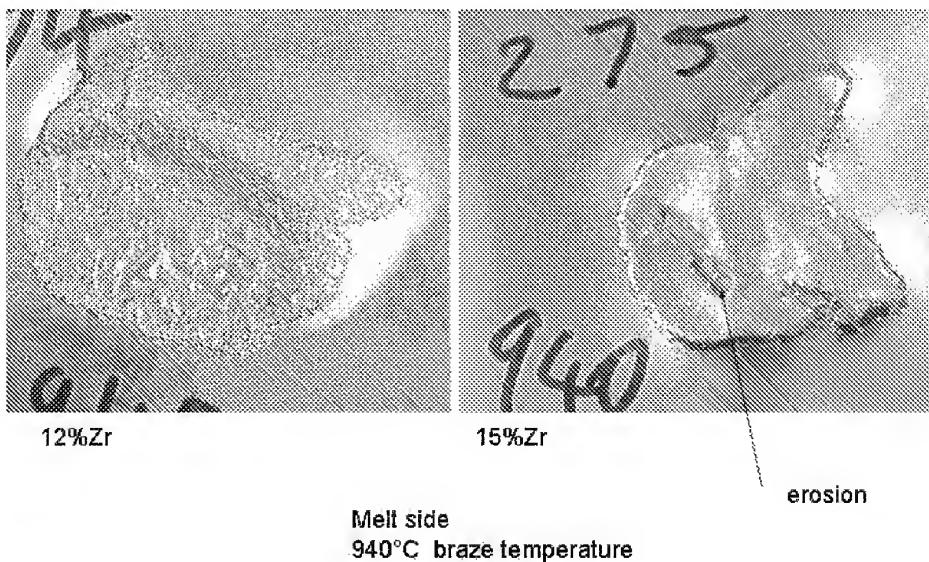
Moreover, to add to the remarks previously submitted to the Examiner, Applicants have undergone additional studies to show that the above prepared brazes, with either 12 wt.% Zr or 15 wt.% Zr, give significantly different results when used at a melt temperature of at least 920°C.

The Figure below shows, in the top two pictures, a 12 wt.% Zr braze used at both 920°C and 940°C. In this case, there is no erosion of the Ti base material. However, as shown in the bottom two pictures in the figure below, a 15 wt.% Zr braze used at either 920°C or 940°C show erosion through the base material.



The figure below shows the front of the 940°C samples from the right hand part of the above figure. This figure, below, again clearly shows that erosion occurs with the 15 wt.% Zr braze at 940°C and does not occur with the 12 wt.% braze.

The Examiner states, "With respect to the claimed amount of Zr, it is the examiner's position that the amounts in question are so close that it is *prima facie* obvious that one skilled in the art would have expected them to have the same properties." Applicants urge that, with the data submitted herewithin (as well as submitted in the previous response), even if one skilled in the art may think that a 3 wt.% difference would be "so close" to be obvious, the actual properties of such "close" compositions clearly show that this not the case. Applicants, however, do not even suggest that a 3 wt.% difference in a critical element, such as Zr, is obvious to one skilled in the art, as was put forth at paragraph 11 the declaration previously submitted and as is put forth again in the attached declaration.



The braze of the present invention may be used in heat exchangers intended for military aircraft. One of the heat exchangers may intended to heat the pilot's cabin. If mixing of the hot and cold air does occur (for example, due to erosion as shown in the figures above), not only will the heat exchanger become inefficient, but also the CO from the exhaust gas may enter the cabin air endangering the pilot, who may gradually lose consciousness. Clearly, if one having ordinary skill in the braze arts were to interpret "about 15 wt.%" to include 12 wt.%, such an interpretation may have catastrophic results.

Additionally, Applicants have submitted a declaration of Derek Raybould, one of the inventors of the present application. Dr. Raybould notes "It is generally known in the art that while a wide range in braze temperature is desirable a small change (+10°C) in melt (braze) temperature will result in either no brazing occurring if the melt temperature increases, or, if the melt temperature decreases, then melting will lead to erosion of the substrate, i.e. melt through, both of which cases are unacceptable. This latter effect is of critical importance for thin sections as occur in a heat exchanger."

The Examiner suggests that "from 0 to not more than 12 wt%" Zr in the braze would be recognized as having the same properties of "about ... 15% Zr" of Vollmer. As shown in the above Figure, this change (from 15 wt.% to 12 wt.%) is significant, and results in a change in braze temperature of about 12°C. Such a change, as noted by the declaration of Dr. Raybould, is unacceptable in the brazing arts.

Furthermore, Dr. Raybould notes, "It is generally known in the art that a braze should have a solidus and liquidus temperature that are close together, preferred braze compositions are therefore eutectics or similar, which have the same solidus and liquidus. These compositions quickly melt at one

temperature, but eutectics are at the bottom of troughs and a very small variation in chemistry will result in a large increase in melt temperature, i.e., the eutectic composition must be maintained, how tightly depends on the alloy.”

Finally, Dr. Raybould notes, “It is generally known in the art that braze chemistry must be tightly controlled and typically is specified to +/-1% for critical elements, such as Zr and perhaps +/-3% for less critical elements such as Ti. In fact, the Honeywell specification for TiCuNiZr, originally written by J. Vollmer, follows this rule and has Ti controlled at less than 3%.” Applying this +/-1% rule to the minimum 15% of the Vollmer patent gives a minimum of 14%. Applying this rule to the maximum (not more than 12%) of this application, gives not more than 13%. So even after applying the tolerances used by Vollmer (+/-1%) there is no overlap in the wt% of Zr between the maximum and minimum chemistries. A **change of 20%** in the amount of Zr – the difference between not more than 12 wt.% (the maximum of the present invention) and 15 wt.% (the minimum of Vollmer) – would be very significant, especially as it would logically have to be applied to the other alloy additions. Such a change, as would be known to one skilled in the art, may be detrimental to braze compositions, which are eutectics or similar.

For the above reasons, Applicants respectfully request reconsideration and withdrawal of the rejection of claims 18-20 and 22-29 as being anticipated by Vollmer and as being unpatentable over Vollmer.

### CONCLUSION

Applicant again would like to thank the Examiner for taking the time to discuss the proposed amendments in a telephone interview. Reconsideration and withdrawal of the Office Action with respect to claims 18-20, 22-39 and 45

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are requested. Applicant submits that claims 18-20, 22-39 and 45 are now in condition for allowance. Early notice to that end is earnestly solicited.

In the event that the examiner wishes to discuss any aspect of this response, please contact the attorney at the telephone number identified below.

Respectfully submitted,

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